

### A Deductive Approach in Introducing Quantum Mechanics to Undergraduates

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Distance techniques of teaching are used at the Open University where the student-teacher contact is minimal. Printed material comprises the main medium of instruction. The subject must be presented (a) in a logical order, (b) in simple terms and (c) in an interesting manner, for effective knowledge transfer. These three principles are applicable to face-to-face lectures delivered at a conventional University as well. However, they are more important in the distance mode of teaching. Also, one has to be mindful of the prejudices of the students against quantum mechanics.

At present the widely accepted and practised approach in introducing quantum mechanics is the historical or the inductive approach. This is well demonstrated by the fact that almost all the books on elementary quantum mechanics have adopted it. The flow of a typical presentation is as follows. (1) Quantization of electromagnetic radiation; Blackbody radiation, photoelectric effect and Compton effect. (2) Atomic spectra; the Bohr model. (3) Dual nature of subatomic particles; de Broglie hypothesis (4) Heisenberg uncertainty principle. (5) A heuristic deduction of the Schrodinger equation. (6) Postulates of quantum mechanics. It is argued that this approach has a number of undesirable features. As a remedial measure a deductive approach is suggested.

The flow in the deductive approach is as follows. (1) What is a theory and why do we need theories: Eliminates the need to store all the experimental results; Can predict the results of experiments not done yet; A particular theory is valid for a particular class of experiments. (2) Newtonian mechanics and its failure: What are postulates: Classical mechanics is based on three postulates: Does not work with sub atomic particles. (3) Peculiarities of the behaviour of subatomic particles; A Gedanken double slit experiment with bullets, waves and electrons. (4) Postulates of quantum mechanics.